# Cryocooler Technology Integrated into the Hubble Space Telescope

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## Payoff

The Air Force Research Laboratory's (AFRL's) development and integration of the Turbo Reverse Brayton Cryocooler into the Hubble Space Telescope is expected to increase the mission life of the Near Infrared Camera and Multi-Object Spectrometer (NICMOS) from 1.6 to at least 3.2 years.

## Accomplishment

Scientists from the National Aeronautics and Space Administration (NASA), the Ballistic Missile Defense Office (BMDO), and the Air Force Research Laboratory (AFRL) will use Creare Reverse Brayton closed loop cryocooler technology to replace a depleted cryostat on the Hubble Space Telescope. This cryocooler will provide 8W @ 70K; 300K heat rejection for the NICMOS. The first flight demonstration of the 0-g performance of Reverse Brayton technology occurred on STS-95. Following successful demonstration, the cryocooler will be installed on the Hubble Space Telescope during a servicing mission in late 1999. The design of this cryocooler leverages both BMDO/AFRL Engineering Development Model (EDM) and Miniature Machine Reverse Brandon Cryocooler (MMRBC) development efforts.

## Background

Heat-detecting infrared telescope sensors can see light at very great distances. Hubble's NICMOS is currently cooled using a solid nitrogen dewar. Unfortunately, heat in Hubble's interior is unexpectedly leaking into the dewar and melting the nitrogen faster than expected. As a result, the 4.6-year mission would have been shortened to 1.9 years. AFRL's development of the Turbo Reverse Brayton Cryocooler is expected to lengthen the NICMOS mission by at least a factor of two.